Garfield Electronics

DOCTOR CLICK

The Doctor Click is all about synchronizing sequencer timing, drum machine timing, and synthesizer VCF, VCA and VCO modulation.

Since the Doctor Click is a universal synchronization tool, it will read click tracks, built click tracks, live drum tracks, electronic drum tracks, and all of the sync codes used by Roland, Oberheim, and Linn.

From any one of these drive sources, the Doctor Click will provide the appropriate interface for practically every sequencer, drum machine and synthesizer made.

Since the Doctor Click will sync to click tracks, it is an invaluable tool to the film scoring end of the business. And, since it will sync to a live drummer, it allows the recording artist to cut his original tracks with a real drummer's feel and then sync the computerized overdubs to his timing, instead of vice versa. These two features, coupled with the device's ability to read the sync codes used by Roland, Oberheim and Linn, and provide envelope modulation the rate of which is locked to the rhythm of the track, make it the synchronizing tool. In addition to all this, the Doctor Click's metronome provides both beats per minute for musicians, and frames per beat for film makers, utilizing a .001% crystal.

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FIXED CLOCK OUTPUTS

Grouped together on the back panel are the four fixed clock outputs. In addition, the 5 pin DIN sync out jack provides a 24X clock and start signal for Roland and Korg units.

96X:	Oberheim DMX and DSX
48X/PGM:	Linn LM-1, LinnDrum, Roland MC-4
24X:	Step programming
12X:	Roland CR68, CR78, most step programmin
DIN sync:	Roland and Korg units

Each of the five fixed clocks provides a timebase output when the Doctor Click is in play mode. When in reset mode the 48X/PGM jack serves as the output for the Doctor Click's step and auto-programming functions. The appropriate timebase (clock) should be connected to the external clock input of the sequencer or drum machine to be used.

CHANNELS ONE AND TWO

Each of the two channels has its own set of rhythm selector buttons.

The buttons for channel one, govern the rhythmic value of the channel one functions:

- Envelope one
- Gate
- Time Lag
- Aútoprogrammer

The buttons for channel two govern the rhythmic value of the channel two functions:

- Envelope two
- Headphone

The first row of numbers under each set of selectors refers to the timebase interpretation of each button. (3=three clocks per beat, 24=twenty-four clocks per beat). The second row refers to the notational interpretation. (4=quarter note, 8T=eighth note triplet). On channel one there is a third row of numbers which indicate the notational interpretation of the low range of that channel. (1=whole note, 2MT=two measure triplet).

THE ENVELOPES

The envelopes can be used to rhythmically control any two of the VCA, VCF or VCO parameters on a synthesizer. Each has provision for attack, decay, amount, inversion, pulse width variation and rhythmic value. The function of attack, decay, and amount function the same as on any typical AR envelope. Pulse width is normally 50% and may be varied by pressing the PW VAR switch and adjusting the PW control. Inversion offsets the selected rhythm by one half of its note value. Therefore, quarter note rhythm inverted would produce quarter notes on the upbeat eighths. Rhythmic value is set by the rhythm selectors associated with each channel. The envelopes should not be used to clock sequencers or drum machines.

Envelope one may be varied between 0 and 13 volts for VCA or VCF modulation by adjusting the amount control. Envelope two can be varied between 0 and 13 volts for VCA or VCF modulation when a plug is inserted half way into the jack, the output will be variable from 0 to 2 volts when a plug is inserted all the way. This reduced scaling should be used for VCO modulation, since it takes much less voltage to modulate a VCO control voltage input than a VCA or VCF input.

The envelopes can be combined with a Y-cord to produce complex control waveforms. It should also be noted that separate synthesizers can be controlled by the envelopes with like rhythm selector settings but with one channel in the invert mode for stereo effects.

ENVELOPE WAVESHAPES

By varying the attack, decay, inversion, pulse width, and rhythm selector controls, it is possible to obtain a variety of rhythmic control waveshapes with the two envelopes:

Short PW and attack, long decay

Long PW and attack, short decay

Square PW, medium attack and decay

Square PW, short attack and decay

Short PW, attack and decay

Long PW, short attack and decay

In instances where a fixed DC control voltage is needed, it can be obtained on either envelope by not pressing any rhythm selector button after power up and getting the Doctor Click into play mode. 0 to 13 volts continuously variable at the envelope one output will be available by adjusting that envelope's amount control. 0 to 2 volts or 0 to 13 volts will be obtained at the envelope two output dependent upon the depth of plug insertion and the setting of the amount control.

CHANNEL ONE FUNCTIONS

ENVELOPE ONE

Envelope one is used to control VCA or VCF parameters on synthesizers, or to set a DC bias voltage as described previously.

GATE

The gate output is a rising edge clock, the rhythmic value of which can be set to any one of sixteen values by the channel one rhythm selectors. Pulse width is normally square, and may be varied by engaging the gate PW VAR switch and adjusting the gate PW control.

The gate can be used as a variable clock output to sequencers, arpeggiators, and drum machines. It can also be used on synthesizer trigger or gate inputs. Inserting a plug all the way into the jack will provide a 5 volt level, and half way will result in a 15 volt level. (15 volt level is particularly intended for the Prophet REV 2 gate input and Moog equipment).

It should be noted that when an ADSR envelope is controlled by its gate input, the pulse width of the applied gate is analogous to the amount of time that a key on the keyboard would be held down. An ADSR attacks, then decays to its sustain level while the key is held down, then waits for the key to be released before executing its release function.

TIME LAG

The Time Lag output is a falling edge clock, the pulse width of which is varied by the gate PW controls, and the rhythmic value of which is set by the channel one rhythm selectors. It can be used to drive falling edge triggered sequencers such as the Emulator.

When Time Lag is used to control rising edge gate or trigger inputs, note that it is the location of the rising edge that is affected by pulse width variation. This feature can be used to trigger an envelope which needs time to develop, (such as sleigh bells), by delaying the rising edge to the point that it is just a bit early relative to the next rhythm note. The simplest way to set this up is to connect the Time Lag output to a set of headphones or other audio input, set the rhythmic value with the channel one rhythm selectors, and listen to the sound of the output. Engage the gate PW VAR function and vary the PW VAR control to make the output sound like it did when the pulse width was not varied. Now when channel one is put in its normal mode the rising edge of the Time Lag output will be right on the beat and can be moved early or late by fine tuning the [illegible]

LOW RANGE

Channel one has an additional eight rhythm values which may be accessed in the Low Range mode. These values are indicated by the third row of numbers under the rhythm selectors which express the notational interpretation of the value. When Low Range is selected, the next input pulse will "mark" the beginning of the cycle. Therefore, when driving from pulse inputs, press LOW RANGE and PLAY simultaneously when cueing. If it is desired to change rhythm while in play, do so on the downbeat of the pattern in progress.

ENVELOPE TWO

Envelope two is used to control VCA, VCF, or VCO parameters on synthesizers, or to set a DC bias voltage as previously described.

HEADPHONE

The headphone output jack is located on the front panel. It is a low impedance stereo output which delivers a click track at a rate determined by the channel two rhythm selectors. It may be used to increase the rate of an existing click track, regenerate a distorted click track, or construct a click track from any pulse or sync code input. It may also be used as a clock output when its pulse width is lengthened by passing through the Doctor Click's delay unit with the delay time set to minimum. Mono plugs should be inserted halfway into the headphone jack.

ADDITIONAL FUNCTIONS

TRIGGER

This is the output of the circuitry just after the mask controls. It may be used to convert a drum part on tape to a sequence of synthesizer triggers by an adjustment of GAIN, THRESHOLD, and MASK which will be personalized for each part. By using these triggers to control the individual triggers on a DMX or LinnDrum, it is possible to double or replace an existing drum track, drum by drum. It is likely that microprocessor related delays will be encountered. These delays can be nulled by using the techniques described in the section on determining a microprocessor related delay adjustment.

The trigger can also be used in conjunction with the step switch to create a built click track or for editing-in pulses when syncing to a live drummer.

START OUT

This output is normally at ground and goes to 5 volts when the Doctor Click is in play mode. It is used in conjunction with the 12X clock output to run the Roland CR68 and CR78.

METRONOME

The metronome is started or stopped by pressing the start switch. If the B/M led is lit, beats per minute calibration is indicated. Otherwise, the calibration is in frames per beat. Both interpretations are read from the thumbwheel switches. 137 means 13 and 7/8 frames per beat or 137 beats per minute depending upon mode. It is possible to dial in unusual values such as 13 and 9/8 frames per beat. This is the same tempo as 14 and 1/8 frames per beat. (Similarly, 138 and 140 settings are equivalent in frames per beat mode.)

FRACTIONAL TEMPOS

To obtain a fractional tempo, such as 118½ beats per minute, drive the Doctor Click from the metronome set to 237 beats per minutes. Set the gate PW VAR controls to make the gate output sound like a metronome. Enter low range, set half note rhythm on the channel one rhythm selectors. The gate output will now be a click track of 118½ beats per minute.

Frames per beat fractional tempos can be obtained by multiplying the click rate. To obtain a 12 and 3/16 frame click, drive the Doctor Click from a 24 and 3/8 frames per beat click. Set the channel two rhythm selectors for eighth notes and get the 12 and 3/16 frame click from the headphone output jack. The general formula is to double the frame count (12 to 24), and set the 1/16ths of frames on the 1/8 frame digit position.

THE OUTPUTS IN GENERAL

All outputs are at ground when the Doctor Click is in reset mode except the Metronome and Trigger outputs which are always active, and Time Lag which remains at 5 volts in reset mode.

PROGRAMMING FUNCTIONS

When the Doctor Click is in reset mode, the 48X/PGM output can be pulsed by pressing the Step switch. This feature is used as a means of counting clock pulses into a sequencer, or, as described later, to create a built click track.

The 48X/PGM output can also deliver specific numbers of pulses ranging from 2 to 768 at a frequency of 384 HZ when the channel one rhythm selectors are used. The section on programming covers the use of these functions in greater detail.

DRIVE OPTIONS

PULSE OPERATION

Begin from reset mode with GAIN, THRESHOLD and MASK at minimum and FINE at about 9 o'clock. Pulse information (click track, electronic drums, live drummer, built click track) should be connected to the unit through the pulse input jack. The Doctor Click's internal metronome connects to the Pulse Input jack when no plug is inserted.

THRESHOLD AND GAIN CONTROLS

Adjust the THRESHOLD control to obtain an indication of the input on the Threshold and Mask LEDs. If an indication is not obtained in any setting of THRESHOLD, then increase GAIN a bit. Check to make certain that the cable connected to the Pulse Input jack does, in fact, carry the pulse input information if an LED indication cannot be obtained in any combination of GAIN and THRESHOLD.

MASK CONTROLS

When the THRESHOLD and GAIN controls have been adjusted, the information indicated by the Threshold LED is passed on to the Mask LED and Mask controls. Increasing the MASK control will adjust the length of time that the Mask LED will remain lit after it has received a pulse. While it is lit additional information indicated by the Threshold LED will not be recognized.

Masking would be set to "filter out" unwanted information in the pulse input, such as a pickup note in an electronic drum kick pattern, or noise in a live track. The FINE control has the same function as the MASK control, but over a smaller time increment. The MASK and FINE MASK controls are additive.

PULSE CUEING

Record a click track on tape for enough time to cover the length of the composition. Rewind the tape and connect the click track to the Pulse input on the Doctor Click. Play the track and adjust GAIN, THRESHOLD, MASK and FINE as needed to obtain a rhythmically consistent indication on the MASK LED.

Rewind the tape, press RESET, make connections to the synthesizers, sequencers and drum machines to be used and place all machines in their start modes, where applicable.

Start the tape and press PLAY just before the beat upon which you want the Doctor Click to go into play mode. Though the Doctor Click is ready anytime after the first beat, eight beats [illegible] from is suggested for ease of cueing.

PULSE CUEING (Continued)

Pressing the PLAY button while in play mode will cause the Doctor Click to go into reset precisely on the following pulse, while pressing RESET while in play mode will cause the machine to reset immediately.

MODES OF PULSE OPERATION

There are three modes of pulse driven operation: Real Time, Memory Record and Memory Playback. Real Time mode is used to sync from click tracks or electronic drum tracks. Memory Record and Memory Playback modes are used when syncing from a built click track or live drummer and are covered in the section on the memory function. Maximum sampling time between input pulses is four seconds.

SYNC CODE DRIVE

Oberheim sync code would be inserted into the CODE A/B jack and CODE A selected on the front panel. The PHASE button will affect the clock by approximately ½%; use the position which sounds best with existing tracks.

Linn LM-1 or Roland MC-4 sync should also be connected to the CODE A/B jack and CODE B selected on the front panel.

LinnDrum code, external clocks or the Doctor Click live track sync code should be connected to the CODE C jack. No front panel selection is necessary when driving from Code C. The Code C system is normalled to the LinnDrum sync code, which is a 48X clock. Therefore, when driving from an external clock or live sync code which is in timebase 96, all functions will operate at twice their normal speed.

SYNC CODE CUEING

Connect the sync code or external clock to the appropriate jack. Rewind the tape. Press RESET. Start the tape. When the sync code starts, the Doctor Click will automatically go into play mode. Press RESET before each sync code cue.

MICROPROCESSOR RELATED DELAYS

Since all sequencers and drum machines contain a microprocessor chip which makes decisions concerning what action should be taken when a clock pulse is applied to the unit. The time that it takes for the decision to be made and the action resulting in an audio output is the cause of a delay which can vary from approximately 5 to 100 milliseconds dependent upon the particular sequencer or drum machine used and its current setting. Therefore, it is recommended that the click track or sync code being used as the Doctor Click's drive source be delayed by a value of 50 to 100 milliseconds from tape at the outset so that it can be moved forward or backwards in time as needed to equalize the various processor related delays which will be encountered when syncronizing several brands of instruments on the same track.

In cases where a slow machine must be synced to existing tracks generated by a faster machine or to a live drummer, a "pre-echoed" track must be generated. Turn the tape over and bounce the click track or sync code on tape to another track through a 50 to 100 millisecond delay. Since the reels are reversed and the tape is effectively running backwards while this delay is introduced, the newly created click track or sync code track will be early, or "pre-echoed", by the 50 to 100 milliseconds when the tape is turned around forward again. This pre-echoed track is now played into the Doctor Click through the studio delay which can be adjusted to allow each machine used the time it needs to process the clock pulses which it receives.

THE DOCTOR CLICK'S INTERNAL DELAY UNIT

Most studio delays are set up to resolve fairly easily to one or two milliseconds. This is adequate for audio use. However, when using the studio delay to adjust the feel of a sequencer or drum machine, this degree of resolution proves to be insufficient. A "mini" delay unit located on the rear panel of the Doctor Click can be used to fine tune the overall delay.

The clock output which is to be used is connected to the Doctor Click's delay input. The delay output is then connected to the sequencer or drum machine which is to be clocked. The range of the delay is continuously variable from 0 to 1.5 milliseconds only and will effectively add to the amount of delay introduced by the studio delay unit.

The delay input is rising edge sensitive only and the delay output is a rising edge clock of 0 to 5V when a plug is inserted all the way, or a falling edge clock of 5V to 0V when the plug is inserted only half way. (The falling edge clock is particularly useful for clocking the Emulator sequencer). Delay output pulse width is 2 milliseconds when a plug is inserted all the way into delay input jack. However, the Synclavier external clock input requires a minimum pulse width of 10 milliseconds which can be obtained by inserting the plug only halfway into the delay input jack.

DETERMINING A MICROPROCESSOR RELATED DELAY ADJUSTMENT

Adjust the synthesizer connected to the sequencer for a click track like sound. Step program the sequencer with a quarter note loop in timebase 12 as described in the section on step programming.

Drive the Doctor Click from its internal metronome. Connect Metro Out to an audio input through a studio delay unit. Connect the synthesizer's output directly to an audio input. Connect a 12X clock of the appropriate edge polarity to the external clock input on the sequencer and put the sequencer it its play mode. Start the metronome and then cue the Doctor Click. Adjust the studio delay to make the metronome and synthesizer clicks sound as close together as possible. Once this has been done, the sequencer's processor related delay time has been determined.

When determining the delay time for a drum machine, use a cowbell or similar sound programmed in quarter notes for comparison to the delayed Metro Out.

In actual use, the click track or sync code on tape is passed through the studio delay, which should be adjusted to compensate for the processor related delay of the machine to be used. The output of the studio delay is then connected to the appropriate input on the Doctor Click. The clock which is to be used is then passed through the Doctor Click's delay unit, where it can be fine tuned, and then to the external clock input on the sequencer or drum machine.

THE MEMORY FUNCTION

The memory function allows sequencers, drum machines and synthesizers to sync to the varying tempos of a human drummer or a built click track. This is accomplished by playing the built click track or drummer's kick and snare into the Doctor Click while in Memory Record mode and then rewinding the tape and playing it in again with the Doctor Click in Memory Play mode.

Since the built click track is a consistent stream of quarter or eighth note values, it can be entered into memory immediately. Adjust the GAIN, THRESHOLD and MASK controls as usual, then rewind the tape to the beginning of the click track. Press the MEMORY switch and then the RECORD switch on the Doctor Click. The LEDs on both switches will light indicating Memory Record mode. Now start the tape and let it play through to the end of the track. The timing of the piece is now in the Doctor Click's memory.

Rewind the tape again to the beginning of the track. Press the RECORD switch again. Only the Memory LED will be lit indicating Memory Play mode. Now when the built click track is played into the Doctor Click, sequencers, drum machines and synthesizers connected to the various clocks or envelope outputs will play with the varying rhythm of the built click track.

Unlike Real Time (metronome driven) pulse cueing, the Doctor Click can be successfully cued on the first beat of the input by pressing PLAY anytime before the occurance of the first click when in Memory Playback mode. Furthermore, it is possible to generate a "live" sync to tape code by recording one of the higher timebases (such as 48X or 96X), on an available track while the Doctor Click is being driven in Memory Play mode. The advantage here is that once this code is on tape, it will not be necessary to reload the Doctor Click's memory each time the composition must be worked on, if it is to be an ongoing project. However, the memory will retain its contents as long as power is maintained.

The "live" sync code is read by the Doctor Click through the CODE C input. Bear in mind that the C input is normalled to timebase 48. Therefore, if you have chosen to record a timebase 96 sync code, remember that all timebase and rhythm related functions of the Doctor Click will run at twice their normal speed. It will be necessary to record a timebase 96 sync if you are expecting to be using an Oberheim DMX drum machine or DSX sequencer on the track. As usual, when driving from CODE C, press RESET before each pass through the track.

[illegible] A LIVE DRUMMER

[illegible] a live drummer through the memory function the kick [illegible] channels are first bounced to an open track. This [illegible] track is created because usually it will be necessary to [illegible] a few places in the kick-snare pattern where the kick did not play on 1 and 3, or the snare did not play on 2 and 4. This kind of rhythmic inconsistency is repaired by bouncing a pulse into the vacant downbeat. This pulse can be generated from a LinnDrum, DMX, or by the Doctor Click STEP switch when it is in the configuration used for creating a built click track.

The end result of the guide track must be a continuous series of sounds on the downbeats of the music. To quickly and conclusively determine where patching is needed, it is recommended that the 96X output be connected to an audio input which will make it possible to hear it as the guide track plays into the Doctor Click. (This can be done while the kick and snare channels are being bounced to create the guide track as an additional savings of time). Adjust the MASK and FINE MASK controls to tightly mask out non-quarter note information which may be present in the kick and snare channels. Listen to the 96X output as the guide track plays into the Doctor Click. The pitch will vary in accordance with the kick-snare, snare-kick timing of the drummer. If the frequency should suddenly jump to a radically different pitch, it indicates that this is a spot in the guide track which will require patching, (though it is possible that tightening the masking a bit more will solve the problem). Note the tape machine locater reading at all points where sudden pitch change in the 96X output occurs as the guide track is being initially created.

When the song has ended, you should have the kick and snare channels combined onto the guide track and a list of the locater readings where there are problems. Now return to each of these locations and patch the guide track by overdubbing or erasing material as required. Once all of the locations on the list have been patched, the guide track can be entered into the Doctor Click's memory by pressing MEMORY and then RECORD which will light both LEDs indicating Memory Record mode. Just to make certain that the guide track has been thoroughly patched, listen to the 96X output as the guide track is entered into memory and be sure that the pitch does not change radically.

Once the patched guide track has been entered into memory, the "live" sync to tape code can be generated and recorded on a track by re-winding the tape, pressing the RECORD switch again, (which puts the Doctor Click in Memory Play mode), pressing the RESET switch, then the PLAY switch, and finally, playing the guide track into the Doctor Click once more. Once this sync code has been laid on a track, the guide track will no longer be needed.

As an option, a quarter note click track can be generated and recorded on a track while the Doctor Click is being driven from the guide track. This live click track will be in sync with the quarter note information of the guide track. The advantage of replacing the patched kick-snare guide track with the live click track is that the

live click track can be subsequently entered into memory at a later date without the careful adjustment of masking required to successfully lock onto the original guide track. The live click track can be obtained by setting the channel two rhythm selectors for quarter notes and inserting a plug halfway into the headphone jack. Turn the headphone switch on and turn up the volume.

Test the sync track by feeding it into the CODE C input, then making sure that a sequencer or drum machine stays in sync with the drummer for the duration of the song. Be sure to apply the information covered in the section on microprocessor related delay adjustment.

CREATING A BUILT CLICK TRACK

In film work, it is often desirable to specify the tempo of a piece by manually entering metronome clicks on to tape. When in RESET mode, pressing the STEP switch will cause a pulse to appear at the 48X/PGM output. If this output is patched to the pulse input and the MASK and FINE MASK controls are set to minimum, then a metronome like click sound will appear at the trigger output.

USING THE DOCTOR CLICK ON A FILM SCORING STAGE

Prior to the session, use the information contained in the section on microprocessor related delay adjustment to determine the delay time of the sequencer to be used. At the session, instruct the control room to provide a separate cue send to the Doctor Click which contains only the click track.

The click which is sent to the cue buss for the orchestra musicians should be delayed by an amount equal to the sequencer's processor related delay. Since the click which drives the Doctor Click is ahead of the click heard by the orchestra by the processor related delay increment, the sequencer will play the synthesizer in sync with the orchestra.

When syncing to a built click track, the Doctor Click's memory should be loaded during the first rehearsal of the cue. There must be no talkback or instruments on the cue buss which feeds the undelayed click track to the Doctor Click.

PROGRAMMING

TIMEBASES

The number associated with the term timebase states how many clock pulses will be set equal to the rhythmic value indicated by the lower number of the time signature. In short, this amounts to clocks per beat. For example, a sequencer programmed in timebase 96 would require 96 clock pulses to play a quarter note's worth of music when the time signature is 4/4, 3/4, or 5/4. Similarly, an eighth note would require the passage of 48 pulses.

STEP PROGRAMMING IN TIMEBASE 12 AND OTHER TIMEBASES

12 is most often the best choice of timebase for step programming operations since it can provide adequate rhythmic resolution for most sequences. In timebase 12, rhythmic values are assigned step counts as shown in the following table:

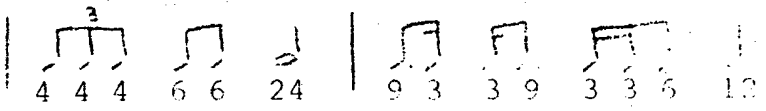
TIMEBASE 12 STEP COUNT TABLE

𝅗𝅥 =24	𝅗𝅥. =36	𝅗𝅥 T=16
♩ =12	♩. =18	♩ T=8
♪ =6	♪. =9	♪ T=4
𝅘𝅥𝅯 =3		𝅘𝅥𝅯 T=2
		𝅘𝅥𝅰 T=1

T=Triplet

One way to record a step program is to write the rhythmic pattern to be entered in notation, and then add the step count numbers above or below each of the notes. Next, connect the 48X/PGM output of the Doctor Click to the external clock input of the sequencer. Put the Doctor Click in RESET mode and then put the sequencer in RECORD mode. The sequence is now recorded by holding each note of the sequence on the synthesizer keyboard and then counting in the appropriate number of steps using the STEP button on the Doctor Click.

EXAMPLE OF A STEP COUNT GUIDE IN TIMEBASE 12

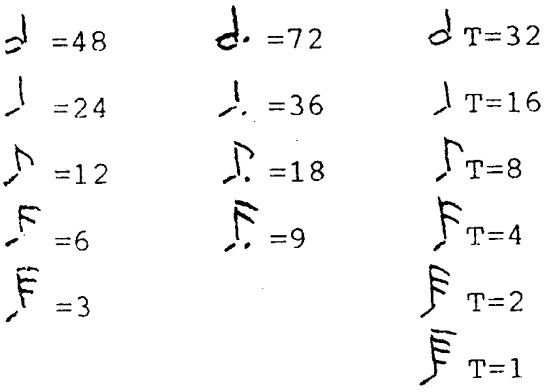


After the sequence has been recorded, it is possible to check that the right number of steps has been recorded for each note by putting the sequencer into play mode and then using the STEP switch to advance the program step by step observing that the number of steps between notes corresponds to the rhythmic value desired. Note that some sequencers will automatically enter the first step when a note is depressed. Sometimes this happens only on the first note of the sequence (Emulator), and other times on each note of the sequence (Model 800).

STEP PROGRAMMING IN TIMEBASE 12 AND OTHER TIMEBASES (Continued)

Step programming in higher timebases such as 24 allow greater rhythmic resolution since thirty seconds and dotted sixteenths become available.

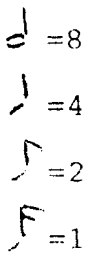
TIMEBASE 24 STEP COUNT TABLE



T=Triplet

Unless entering a sequence which requires these smaller rhythmic values, it is best to avoid timebase 24 since the actual number of steps to be entered for the sequence is double the number used for timebase 12 programming. In cases where the rhythmic resolution of a sequence is very limited, say quarter and eighth notes only, by all means consider using a timebase such as 4 in order to save time in the programming cycle.

TIMEBASE 4 STEP COUNT TABLE



PLAYBACK

After a step sequence has been programmed into the sequencer, it can be played back by connecting the external clock input of the sequencer to the Gate output which will provide a rising edge of 0 to 5 volts when a plug is inserted all the way or of 0 to 15 volts when a plug is inserted half way.

When a falling edge clock is required, it can be obtained by connecting the sequencer to the Time Lag output which provides 5 to 0 volt output. The timebase which appears at the Gate or Time Lag outputs is set by the channel one rhythm selector.

AUTOPROGRAMMING FUNCTION

The Doctor Click will program timebase 48 rhythms into sequencers through the 48X/PGM output. This is done by placing the sequencer in its Real Time RECORD mode with the 48X/PGM output connected to its external clock input and the Doctor Click in RESET mode with no plug inserted into either of the sync code inputs.

While holding the appropriate keys on the keyboard connected to the sequencer, pressing a channel one rhythm selector button will cause its value to be entered into the sequencer's memory in timebase 48. The Reset LED goes dark while the programming operation is taking place and the keys on the keyboard must be held down until it lights again, indicating that the appropriate number of pulses have been delivered.

When both hands are needed on the keyboard to hold notes, the rhythm can be entered by foot if a momentary footswitch has been inserted into the Enter Footswitch input. In this case, the rhythm selectors serve only to set up the rhythm to be entered.

Inserting a plug only half way into the 48X/PGM jack provides a falling edge clock as opposed to the normal rising edge clock which results when the plug is inserted all the way. Programming takes place at 384 HZ. The actual number of pulses delivered can be determined by dividing the number 48 by the timebase number associated with each rhythm selector button. For example, the 16th note triplet rhythm corresponds to timebase 6; 48 divided by 6 equals 8; therefore, when that button is used in the autoprogramming function, 8 pulses are delivered. Similarly, the eighth note button delivers 24 pulses.

FOOTSWITCHES

In addition to the Enter Footswitch jack, which can be used in the Autoprogramming mode, both the Play and Reset functions can be remotely controlled by inserting a momentary footswitch into the appropriate jack on the rear panel.

INTERFACING

ROLAND DRUM MACHINES

The TR606, TR808, CR5000 and CR8000 interface to the Doctor Click by interconnecting the 5 pin DIN jack on the drum machine to the DIN jack on the Doctor Click. The switch next to the DIN jack on the drum machine should be switched to the "IN" position.

The CR68 and CR78 can be interfaced by connecting the Start output on the Doctor Click to the start jack on the drum machine, and the 12X output on the Doctor Click to the external clock in on the drum machine.

ROLAND SEQUENCERS

The MC-4 is controlled by setting its timebase to 96, 48, or any of the timebases which the Doctor Click provides, and then connecting the external sync input on the front panel to the appropriate timebase output on the Doctor Click. The Sync switch on the MC-4 should be in the external position. It can be controlled through its DIN jack by switching the Sync switch to the DIN position and connecting the DIN jack on the Doctor Click to the DIN jack on the MC-4.

The TB303 Bass Line can be interfaced by connecting its DIN jack to the DIN jack on the Doctor Click. The switch next to the DIN jack on the TB303 should be switched to the "IN" position.

The CSQ600 is controlled by connecting its external clock input to the Gate output on the Doctor Click. Timebase is set by the channel one rhythm selectors.

The SH101 sequencer and arpeggiator are controlled by connecting the external clock in on the SH101 to the Gate output on the Doctor Click. Timebase is determined by the channel one rhythm selectors.

ROLAND ARPEGGIATORS

The arpeggiator external clock inputs on the JP4, JP8, Juno 6, Juno 60 and SH101 are controlled by the Doctor Click's Gate output. The rate of arpeggiation is set by the channel one rhythm selectors. The arpeggiator on the JP8 can also be controlled through the DIN jack by connecting it to the DIN jack on the Doctor Click. The rate of arpeggiation is then set by the three position slide switch next to the DIN jack on the JP8.

ROLAND SYNTHESIZERS

On the JP4, JP8, Juno 6, Juno 60 and SH101, the [illegible] or VCO inputs can be controlled by either or both of the Doctor Click's rhythm envelopes. Gate or trigger inputs can be controlled by the Gate output on the Doctor Click [illegible] which the Gate output will clock the gate or trigger [illegible] the synthesizer is determined by the channel one rhythm selectors.

ROLAND TAPE SYNC

The MC-4 tape sync can be decoded by the Doctor Click by connecting it to the CODE A/B input and selecting CODE B on the front panel. Press RESET on the Doctor Click before each pass through the sync code. When the code begins the Doctor Click will automatically go into play mode.

OBERHEIM

The Oberheim DMX and DSX operate from the 96X output on the Doctor Click, which should be connected to the external clock input on either unit. The individual drum triggers on the DMX can be controlled by the Doctor Click's trigger output. Connect the desired triggering source to the Pulse in jack on the Doctor Click and adjust GAIN, THRESHOLD and MASK for compatibility.

The volume, filter, or VCO inputs on Oberheim synthesizers can be controlled by either or both of the envelopes on the Doctor Click. The arpeggiator external clock input on the OB8 can be controlled by the Gate output on the Doctor Click. The rate of arpeggiation will be set by the channel one rhythm selectors.

The Oberheim sync to tape code can be decoded by the Doctor Click by connecting it to the CODE A/B jack and selecting CODE A on the front panel. The PHASE switch will offset the decoded sync code by ½% and should be used in the position which sounds best with any existing tracks.

LINN

The Linn LM-1 is interfaced by connecting the 48X output to its external clock input. NOTE: Several of the later model LM-1 do not have the external clock input jack installed. Contact Linn Electronics concerning this simple modification. The LM-1 sync to tape code can be read by the Doctor Click by connecting it to the CODE A/B input and selecting CODE B on the front panel. Press RESET on the Doctor Click before each pass through the sync code. The Doctor Click will automatically go into play mode when the code begins.

The LinnDrum is interfaced by connecting the 48X output of the Doctor Click to its sync in jack. The LinnDrum sync code is read by connecting it to the CODE C input on the Doctor Click. Press RESET before each pass through the sync code. The Doctor Click will automatically go into play mode when the code begins. The individual drum triggers can be controlled by the Doctor Click's Trigger out. Connect the desired triggering source to the PULSE in jack on the Doctor Click and adjust GAIN, THRESHOLD and MASK for compatibility.

The Pro One sequencer and the Prophet 10 sequencer can be step programmed, typically in timebase 12. Connect the 12X output on the Doctor Click to the external clock input for playback. These sequencers can also be programmed by the Doctor Click's Autoprogramming Function. If the autoprogramming method is used, the 48X/PGM output should be used for both programming and playback.

The Prophet 5 and Prophet 10 filter and amplifier inputs can be controlled by either or both of the Doctor Click's rhythm envelopes. The Prophet's own ADSR can be triggered by connecting the Doctor Click's Gate to the Prophet's gate in. Connect CV in to CV out on the Prophet so the synthesizer will know what pitch to play.

The Prophet 600 VCF can be controlled by either of the Doctor Click's envelopes.

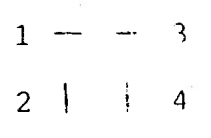
The Pro One sequencer should be step programmed in the lowest acceptable timebase which can be used for the desired sequence. For playback, connect the Gate output on the Doctor Click to the external clock input on the Pro One and set the timebase through the channel one rhythm selectors..

The Model 800 sequencer can be step programmed, typically in timebase 12. Interfacing is accomplished through the 4 pin Cinch jack on the back of the Model 800 as per the accompanying illustration. Connect the Gate output of the Doctor Click to the clock input on the Cinch jack, select timebase 12 on the channel one rhythm selectors and drive the Doctor Click from its internal metronome. While clocking the Model 800 in this manner, adjust the sensitivity control next to the Cinch jack to obtain threshold sensitivity to the 12X clock. When step programming the Model 800, subtract one from each note's step count.

MODEL 800 CINCH JACK CONNECTION DIAGRAM

A 4 pin Cinch plug can be obtained at most electronics stores. Wire it to a phone jack as per the illustration:

PIN 1: GROUND
PIN 2: NO CONNECTION
PIN 3: GROUND
PIN 4: CLOCK IN



VIEW OF JACK
FROM BACK PANEL

KORG

The arpeggiator function on the PolySix can be interfaced by the Gate output on the Doctor Click. Rate of arpeggiation is set by the channel one rhythm selectors. The VCF control voltage input can be connected to either of the Doctor Click's rhythm envelopes.

The KPR-77 drum machine can be controlled by the Doctor Click by interconnecting the DIN jacks and switching the Korg sync switch to the "IN" position.

MOOG

To trigger the MiniMoog, connect the S-trigger input to the Doctor Click's Time Lag output. The MiniMoog's filter can be controlled by either of the Doctor Click's envelopes.

To interface the MemoryMoog, the Doctor Click Gate output should be connected to one of the two external control inputs on the MemoryMoog's back panel to control the arpeggiator functions. Either of the Doctor Click's rhythm envelopes can be used to control the VCF or VCA modulation functions.

MOOG ROGUE

The filter input on the Moog Rogue can be controlled by either of the Doctor Click's rhythm envelopes.

MODULAR MOOG

Modular Moog trigger and clock inputs can be controlled by the Doctor Click's Gate output. VCF or VCA control functions can be interfaced by envelope one or two. VCO control voltage inputs can be controlled by envelope two. When a plug is inserted all the way into the envelope two output jack, the amount control will vary the control envelope from 0 to 2 volts. Other modular synthesizer systems such as those made by E-mu and Serge will also interface to the Doctor Click.

THE EMULATOR

The Emulator sequencer is typically step programmed in timebase 12 by connecting the 48X/PGM output on the Doctor Click to the external clock input via the RS232 interface adapter available from E-mu. For playback, the Time Lag output should be connected to the Emulator's external clock input. The Time Lag output provides the falling edge clock which the Emulator needs. Select timebase 12 on the channel one rhythm selectors during playback of the sequence. When recording the sequence, subtract one from the step count of the first note of the sequence since the Emulator counts the event of the first note being pressed on the keyboard as the first count of the sequence.

THE FAIRLIGHT

The Fairlight divides the external clock by two. Therefore, if B is set equal to 48, then clock the sequencer with the 96X output of the Doctor Click. If B is set equal to 12, then clock from the 24X output of the Doctor Click.

THE SYNCLAVIER

The Synclavier external clock in should be fed from the Gate output. Select timebase 1 on the channel. When syncing the Synclavier to varying tempos, use a timebase greater than 1. Specify this to the Synclavier by dividing the tempo figure by the timebase number used.

TECHNICAL SPECIFICATIONS

INPUTS

Pulse in: This is the input for click tracks, electronic or live drum tracks. Sensitivity is 40mV to 30V. Maximum time between input pulses is four seconds.

Code A/B: This is the input for sync to tape codes used on the Oberheim DMX and DSX (CODE A), Linn LM-1 (CODE B), and the Roland MC-4 (CODE B). Sensitivity is 200mV to 5V.

Code C: This is the input for the sync to tape code used on the LinnDrum, and for the Doctor Click's live track sync. Sensitivity is 300mV to 5V.

OUTPUTS

All outputs have sufficient drive to run several units simultaneously in parallel. Headphone output impedance is 10 ohms. All others are 1K to 5K ohms.

12X: Timebase 12 output, 12 clocks per beat. 5V rising edge clock.

24X: Timebase 24 output, 24 clocks per beat. 5V rising edge clock.

48X/PGM: Timebase 48 output, 48 clocks per beat. 5V rising edge clock when plug is inserted all the way, 5V falling edge clock when plug is inserted half way. STEP switch and Autoprogramming functions operate through this output when in reset mode.

96X: Timebase 96 output, 96 clocks per beat. 5V rising edge clock.

Gate: Variable clock output. Timebase is set by channel one rhythm selectors. Pulse width is square or variable 5V rising edge clock when plug is inserted all the way. (15V rising edge clock when plug is inserted half way. Can be used on gate or trigger inputs on synthesizers. Affected by the channel one invert function.

Time Lag: Inverted Gate output. 5V <u>falling</u> edge clock. Timebase is set by the channel one rhythm selectors. Pulse width is normally square. Varying Gate PW VAR control causes the location of the RISING edge to be altered. Can be used on trigger or gate inputs on synthesizers. Affected by the channel one invert function.

[illegible]: Square or variable pulse width. Adjustable attack to decay. 0 to 13V continuously variable output. Rhythm is set by channel one rhythm selectors. Four measure 64th note triplet range. Provides VCA or VCF modulation waveforms. Selecting no rhythm allows output to be used as a 0 to 13V continuously adjustable DC [illegible] source.

TECHNICAL SPECIFICATIONS (Continued)

Envelope 2: Square or variable pulse width. Adjustable attack and decay. Output is continuously variable from 0 to 13V for VCA or VCF control when plug is inserted half way. Or from 0 to 2V for VCO modulation when plug is inserted all the way. Rhythm is set by channel two rhythm selectors. Quarter note to 32d note range.

Phones: 0 to 15V continuously variable click track output. Rate is set by channel two rhythm selectors. 10 ohm output impedence. On/off Switch.

Metro: Output of the Doctor Click's metronome. Frames per beat or beats per minute calibrations. Continuously variable 0 to 15V. .001% crystal.

Trigger: Pulse width variable digital pulse generated from the information input to the Doctor Click at the Pulse in jack. 0 to 5V level when plug is inserted all the way. 0 to 15V level when plug is inserted half way.

Sync out: 5 pin DIN sync output for direct interface to Roland and Korg units.

Start: OV when Doctor Click is in reset mode: 5V when Doctor Click is in play mode.

DELAY UNIT

Delay in: Input to the Doctor Click's delay. Accepts rising edge clocks of 5 to 15V. Depth of plug insertion affects pulse width of delay out.

Delay out: Output of the Doctor Click delay. 0 to 5V rising edge clock output when plug is inserted all the way. 5 to OV falling edge clock output when plug is inserted half way. 2msec pulse width when Delay input jack has a plug inserted all the way. 10mSEC pulse width when Delay input jack is inserted half way.

Delay Amt: Continuously variable 0 to 1.5msec.

FOOTSWITCHES

Reset: Grounding momentary footswitch performs the same function as pressing the RESET switch on the front panel.

Play: Grounding momentary footswitch performs the same function as pressing the PLAY switch on the front panel.

Enter: Grounding momentary footswitch from both banks of keys on synthesizer keyboard during polyphonic sequenced applications of the Autoprogramming function.